

S
333.955
E30aifs
2002



**AQUATIC INVERTEBRATES AND HABITAT AT A FIXED STATION ON THE
CLARK'S FORK OF THE YELLOWSTONE RIVER,
CARBON COUNTY, MONTANA**

July 24, 2001

STATE DOCUMENTS COLLECTION

JUL 13 2003

MONTANA STATE LIBRARY
1515 E. 6th AVE.
HELENA, MONTANA 59601

**A report to
the Montana Department of Environmental Quality
Helena, Montana**

**by
Wease Bollman
Rhithron Associates, Inc.
Missoula, Montana
May 2002**

INTRODUCTION

This report is one of 38 brief interpretive summaries of data assembled as part of a statewide, multi-year study conducted by the Montana Department of Environmental Quality (MT DEQ). Each report discusses information generated from a single benthic invertebrate sample collection and habitat evaluation at a fixed station established on a gauged river or high-order tributary. The present treatise focuses on the aquatic community sampled on the Clark's Fork of the Yellowstone River at Edgar, Montana on July 24, 2001. The sample site was located by GPS reading at 45° 27' 52" N, 108° 50' 27" W, lying within the Montana Valley and Foothill Prairies Ecoregion (Woods et al. 1998). The sample was collected by personnel of MT DEQ. Sampling effort consisted of either a composite of four Hess samples, or a one-minute kicknet collection (Bukantis 1998). Habitat parameters were evaluated using the MT DEQ Macroinvertebrate Habitat Assessment Field Form for streams with riffle/run prevalence. Invertebrate samples were processed and animals identified by Rhithron Associates, Inc. Analysis of invertebrate assemblages was accomplished by applying the revised method (Bollman 1998) for streams of Western Montana's ecoregions. The method uses a multimetric battery to evaluate disturbance to biotic integrity.

The revised bioassessment metric battery and its scoring criteria have not been evaluated for application to higher-order streams and rivers; to date, no bioassessment method has been contrived for these waterways in Montana. Thus, the method used here is likely to have limitations in its applicability to the sites in this study. Ninety-eight sites in Western Montana were used to assemble the revised metric battery and to test it for sensitivity in detecting impairment, to establish scoring criteria, and to improve robustness of bioassessment. These 98 sites were mainly second and third order streams; the sampling season roughly corresponded to that of the fixed-station study. Mean water temperature for these sites at the time of sampling was 15°C (median = 14°C). The sites sampled for the fixed stations study are quite different from these test streams. Twenty-five sites located in Western Montana were sampled between July 23 and August 25, 2001 for this study. All are riverine or high-order waterways. Mean water temperature for these sites at the time of sampling was 19.8°C (median = 19.4°). Temperatures ranged from 15.5°C (Kootenai River near Libby) to 25.3°C (Jefferson River near Three Forks). Natural variations in benthic community composition and structure along longitudinal and thermal gradients are well known phenomena. Thus, scores and classifications were established for much smaller systems with significantly lower water temperatures than those included in the fixed stations study group. Impairment classifications and use support designations in this study must be interpreted with care. Results from the application of other metric batteries may be found in the Appendix

RESULTS AND DISCUSSION

Table 1 itemizes the nine evaluated habitat parameters and shows the assigned scores for each, as well as the integrated score and condition category.

Overall habitat conditions scored marginally at this site on the Clark's Fork of the Yellowstone. Instream habitats were perceived to be limited by moderately heavy sediment deposition, and benthic substrate particles were extensively embedded. Benthic substrate was judged somewhat monotonous. Flow conditions were considered marginal. Moderate instability of streambanks was noted, and the riparian zone width was restricted

on both sides of the channel. Cattle grazing was permitted up to the water's edge on the left bank. Some alteration of channel morphology was also reported.

Table 1. Stream and riparian habitat assessment for a fixed station on the Clark's Fork of the Yellowstone River. July 2001.

| Max. possible score | Parameter | Clark's Fork of the Yellowstone at Edgar |
|---------------------|----------------------------------|--|
| 10 | Riffle development | 6 |
| 10 | Benthic substrate | 6 |
| 20 | Embeddedness | 8 |
| 20 | Channel alteration | 13 |
| 20 | Sediment deposition | 8 |
| 20 | Channel flow status | 7 |
| 20 | Bank stability: left / right | 4 / 4 |
| 20 | Bank vegetation: left / right | 7 / 9 |
| 20 | Vegetated zone: left / right | 4 / 6 |
| 160 | Total | 86 |
| | Percent of maximum CONDITION* | 54 MARGINAL |

*Condition categories: Optimal > 80% of maximum score, Sub-optimal 75 - 56%; Marginal 49 - 29%; Poor <23%. Adapted from Platkin et al. 1998.

Table 2. Metric values, scores, and bioassessment for a fixed station on the Clark's Fork of the Yellowstone River. The revised bioassessment metric battery (Bollman 1998) was used for the evaluation. July 2001.

| | Clark's Fork of the Yellowstone at Edgar | |
|--------------------------|--|----------------|
| METRICS | METRIC VALUES | METRIC SCORES |
| Ephemeroptera richness | 6 | 3 |
| Plecoptera richness | 2 | 2 |
| Trichoptera richness | 7 | 3 |
| Number of sensitive taxa | 1 | 1 |
| Percent filterers | 28.9 | 0 |
| Percent tolerant taxa | 23.3 | 1 |
| | TOTAL SCORE (max.=18) | 10 |
| | PERCENT OF MAX. | 56 |
| | Impairment classification | SLIGHT |
| | USE SUPPORT | PARTIAL |

Bioassessment results are given in Table 2. When this bioassessment method is applied to these data, scores indicate that this site on the Clark's Fork of the Yellowstone River is slightly impaired and only partially supports designated uses.

The biotic index value (3.91) and mayfly taxa richness (6) were both within expected limits, suggesting that water quality at this site was unimpaired by nutrients.

toxics, or thermal impacts. The sensitive stonefly *Doroneuria* sp. was collected at this site, supporting the hypothesis that good water quality characterized the site. Moderately warm water temperature and other characteristically riverine conditions were indicated by the presence of the mayfly *Traverella* sp., and the aquatic moth *Petrophila* sp.

Fourteen "clinger" taxa and a rich caddisfly fauna (7 taxa) imply that hard substrates were available for colonization, so although the habitat evaluators observed moderate deposition of sediment, unimpaired areas appeared to have persisted in the channel. The assemblage was taxonomically rich, and predators were well-represented (26 animals in 6 taxa) suggesting that instream habitats of all types were plentiful and diverse. Only 2 stonefly taxa were collected; low stonefly taxa richness may be associated with disruptions to large-scale habitat features such as riparian zone function, streambank stability, or channel morphology.

All expected functional components were present in the sampled assemblage, scrapers were less abundant than expected. This may have been a result of the turbidity of the water, as noted in the field observations.

CONCLUSIONS

- Good water quality and adequate unimpaired habitats supported a diverse assemblage of benthic organisms.
- Turbid water may have been a factor limiting the abundance of scrapers among the functional components of the community.
- The bioassessment method appears to under-estimate the quality of the benthic fauna at this site. Given the taxonomic composition, functional structure, and tolerance characteristics of the assemblage, non-impairment of biotic health is indicated.

LITERATURE CITED

Bollman, W. 1998. Improving Stream Bioassessment Methods for the Montana Valleys and Foothill Prairies Ecoregion. Master's (M.S.) Thesis. University of Montana. Missoula, Montana.

Bukantis, R. 1998. Rapid bioassessment macroinvertebrate protocols: Sampling and sample analysis SOP's. Working draft, April 22, 1997. Montana Department of Environmental Quality. Planning Prevention and Assistance Division. Helena, Montana.

Woods, A. J., Omernik, J. M., Nesser, J. A., Shelden, J., and Azevedo, S. H. 1999. Ecoregions of Montana. (Color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia. US Geological Survey.

APPENDIX

Taxonomic data and summaries

Clark's Fork of the Yellowstone River

July 2001

Aquatic Invertebrate Taxonomic Data

Site Name: Clarks Fork of the Yellowstone River at Edgar

Date: 7/24/01

Site ID: Y05CLFYR01

Approx. percent of sample used: 100

| Taxon | Quantity | Percent | HBI | FFG |
|---|------------|---------------|-----|-----|
| <i>Limnodrilus hoffmeisteri</i> | 10 | 3.14 | 10 | CG |
| <i>Acari</i> | 1 | 0.31 | 5 | PA |
| Total Misc. Taxa | 11 | 3.46 | | |
| <i>Baetis tricaudatus</i> | 5 | 1.57 | 4 | CG |
| <i>Ephemerella inermis infrequens</i> | 18 | 5.66 | 4 | CG |
| <i>Rhithrogena</i> sp. | 10 | 3.14 | 0 | CG |
| <i>Stenonema</i> sp. | 7 | 2.20 | 3.5 | SC |
| <i>Traverella</i> sp. | 68 | 21.38 | 2 | CG |
| <i>Tricorythodes minutus</i> | 15 | 4.72 | 4 | CG |
| Total Ephemeroptera | 123 | 38.68 | | |
| <i>Claasema sabulosa</i> | 4 | 1.26 | 3 | PR |
| <i>Doroneuria</i> sp. | 4 | 1.26 | 0 | PR |
| Total Plecoptera | 8 | 2.52 | | |
| <i>Arctopsyche grandis</i> | 7 | 2.20 | 2 | PR |
| <i>Brachycentrus occidentalis</i> | 27 | 8.49 | 2 | CF |
| <i>Cheumatopsyche</i> sp. | 29 | 9.12 | 5 | CF |
| <i>Hydropsyche</i> sp. | 34 | 10.69 | 5 | CF |
| <i>Hydroptila</i> sp. | 9 | 2.83 | 6 | PH |
| <i>Oecetis</i> sp. | 2 | 0.63 | 8 | PR |
| <i>Psychomyia</i> sp. | 2 | 0.63 | 2 | CG |
| Total Trichoptera | 110 | 34.59 | | |
| <i>Petrophila</i> sp. | 1 | 0.31 | 5 | SC |
| Total Lepidoptera | 1 | 0.31 | | |
| <i>Heterlimnius</i> sp. | 1 | 0.31 | 3 | CG |
| <i>Microcylloepus</i> sp. | 1 | 0.31 | 5 | SC |
| <i>Optioervus</i> sp. | 2 | 0.63 | 5 | SC |
| <i>Zaitzevia</i> sp. | 2 | 0.63 | 5 | CG |
| Total Coleoptera | 6 | 1.89 | | |
| <i>Simulium</i> sp. | 1 | 0.31 | 5 | CF |
| <i>Hexatoma</i> sp. | 8 | 2.52 | 2 | PR |
| Total Diptera | 9 | 2.83 | | |
| <i>Eukiefferiella Gracei</i> Gr. | 1 | 0.31 | 8 | CG |
| <i>Eukiefferiella Pseudomontana</i> Gr. | 2 | 0.63 | 8 | CG |
| <i>Microtendipes</i> sp. | 1 | 0.31 | 6 | CF |
| <i>Paratanytarsus</i> sp. | 29 | 9.12 | 6 | UN |
| <i>Polypedilum</i> sp. | 15 | 4.72 | 6 | SH |
| <i>Thienemannimyia</i> Gr. | 1 | 0.31 | 5 | PR |
| <i>Tvetenia</i> sp. | 1 | 0.31 | 5 | CG |
| Total Chironomidae | 50 | 15.72 | | |
| Grand Total | 318 | 100.00 | | |

Aquatic Invertebrate Summary

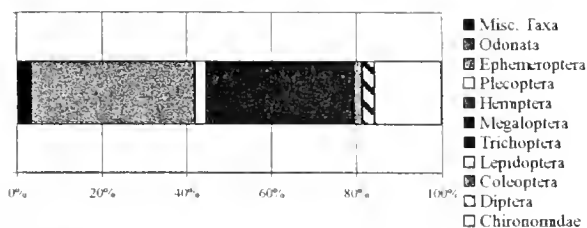
Site Name: Clarks Fork of the Yellowstone River at E Date: 7/24/01

SAMPLE TOTAL 318

| | |
|-----------------|-------|
| EPT abundance | 241 |
| TAXA RICHNESS | 31 |
| Number EPT taxa | 15 |
| Percent EPT | 75.79 |

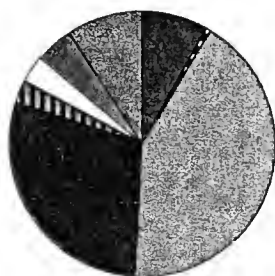
TAXONOMIC COMPOSITION

| GROUP | PERCENT | #TAXA | ABUNDANCE |
|---------------|---------|-------|-----------|
| Misc. Taxa | 3.46 | 2 | 11 |
| Odonata | 0.00 | 0 | 0 |
| Ephemeroptera | 38.68 | 6 | 123 |
| Plecoptera | 2.52 | 2 | 8 |
| Hemiptera | 0.00 | 0 | 0 |
| Megaloptera | 0.00 | 0 | 0 |
| Trichoptera | 34.59 | 7 | 110 |
| Lepidoptera | 0.31 | 1 | 1 |
| Coleoptera | 1.89 | 4 | 6 |
| Diptera | 2.83 | 2 | 9 |
| Chironomidae | 15.72 | 7 | 50 |



FUNCTIONAL COMPOSITION

| GROUP | PERCENT | #TAXA | ABUNDANCE |
|-----------|---------|-------|-----------|
| Predator | 8.18 | 6 | 26 |
| Parasite | 0.31 | 1 | 1 |
| Gatherer | 42.45 | 12 | 135 |
| Filterer | 28.93 | 5 | 92 |
| Herbivore | 0.00 | 0 | 0 |
| Piercer | 2.83 | 1 | 9 |
| Scraper | 3.46 | 4 | 11 |
| Shredder | 4.72 | 1 | 15 |
| Xylophage | 0.00 | 0 | 0 |
| Omnivore | 0.00 | 0 | 0 |
| Unknown | 9.12 | 1 | 29 |



COMMUNITY TOLERANCES

| | |
|----------------------------------|-------|
| Sediment tolerant taxa | 3 |
| Percent sediment tolerant | 10.38 |
| Sediment sensitive taxa | 2 |
| Percent sediment sensitive | 2.83 |
| Metals tolerance index (McGuire) | 3.04 |
| Cold stenotherm taxa | 1 |
| Percent cold stenotherms | 1.26 |

Site ID: Y05CLFYR01

DOMINANCE

| TAXON | ABUNDANCE | PERCENT |
|---------------------------------------|-----------|---------|
| <i>Traverella</i> sp | 68 | 21.38 |
| <i>Hydropsyche</i> sp | 34 | 10.69 |
| <i>Cheumatopsyche</i> sp | 29 | 9.12 |
| <i>Paratanaisius</i> sp | 29 | 9.12 |
| <i>Brachycentrus occidentalis</i> | 27 | 8.49 |
| SUBTOTAL 5 DOMINANTS | 187 | 58.81 |
| <i>Ephemerella inermis infrequens</i> | 18 | 5.66 |
| <i>Tricorythodes minutus</i> | 15 | 4.72 |
| <i>Polypedilum</i> sp | 15 | 4.72 |
| <i>Lamodrilus hoffmeisteri</i> | 10 | 3.14 |
| <i>Rhythrogena</i> sp | 10 | 3.14 |
| TOTAL DOMINANTS | 255 | 80.19 |

SAPROBITY

| | |
|-------------------------|------|
| Hilsenhoff Biotic Index | 3.91 |
|-------------------------|------|

DIVERSITY

| | |
|------------------|------|
| Shannon H (loge) | 2.38 |
| Shannon H (log2) | 3.44 |

| | |
|-----------|------|
| Simpson D | 0.08 |
|-----------|------|

VOLTINISM

| TYPE | ABUNDANCE | PERCENT |
|--------------|-----------|---------|
| Multivoltine | 65 | 20.36 |
| Univoltine | 205 | 64.54 |
| Semivoltine | 48 | 15.09 |

TAXA CHARACTERS

| | #TAXA | ABUNDANCE | PERCENT |
|------------|-------|-----------|---------|
| Tolerant | 10 | 74 | 23.27 |
| Intolerant | 1 | 4 | 1.26 |
| Clinger | 14 | 163 | 51.26 |

BIOASSESSMENT INDICES

B-IBI (Karr et al.)

| METRIC | VALUE | SCORE |
|--------------------|-----------|-------------|
| Taxa richness | 31 | 3 |
| E richness | 6 | 3 |
| P richness | 2 | 1 |
| T richness | 7 | 3 |
| Long-lived | 6 | 5 |
| Sensitive richness | 1 | 1 |
| %tolerant | 23.27 | 3 |
| %predators | 8.18 | 1 |
| Clinger richness | 14 | 3 |
| %dominance (3) | 41.19 | 5 |
| TOTAL SCORE | 28 | 56 % |

MONTANA DEQ METRICS (Bukantis 1998)

| METRIC | VALUE | Plains Ecoregions | Valleys and Foothills | Mountain Ecoregions |
|--------------------|-------|-------------------|-----------------------|---------------------|
| Taxa richness | 31 | 3 | 3 | 3 |
| EPT richness | 15 | 3 | 3 | 1 |
| Biotic Index | 3.91 | 3 | 3 | 2 |
| %Dominant taxon | 21.38 | 3 | 3 | 3 |
| %Collectors | 71.38 | 2 | 2 | 1 |
| %EPT | 75.79 | 3 | 3 | 3 |
| Shannon Diversity | 3.44 | 3 | | |
| %Scrapers +Shredd | 8.18 | 1 | 0 | 0 |
| Predator taxa | 6 | 3 | | |
| %Multivoltine | 20.36 | 3 | | |
| %H of T | 57.2 | | 3 | |
| TOTAL SCORES | | 27 | 20 | 13 |
| PERCENT OF MAXIMUM | | 90.00 | 83.33 | 61.90 |
| IMPAIRMENT CLASS | | NON | NON | SLIGHT |

Montana DEQ metric batteries

